

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/876,955

Atty Docket No. 005329 USA/MASK/RT/OR
PATENT APPLICATION

REMARKS

Claims 1-34 have been examined on their merits.

Applicants herein amend claims 1, 11 and 23 to clarify that the two images, obtained at different out-of-focus positions, are compared with each other to detect defects in a phase shift mask. Entry and consideration of the amendments to claims 1, 11 and 23 is respectfully requested.

Claims 1-34 are all the claims presently pending in the application.

1. Claims 1-34 stand rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1, 2, 3, 7, 12, 13, 14 and 17 of U.S. Patent No. 6,268,093 to Kenan *et al.* Applicants traverse the rejection of claims 1-34 for at least the reasons discussed below.

In an embodiment shown in Figure 1 of the present application, the bottom surface of a reticle 1 is illuminated by light from a light source 3. An objective 10 collects the light transmitted by the reticle 1, which then passes through an aperture diaphragm 12, lenses 13 and 14. A beam splitter 15 splits the beam, and three images of the reticle 1 in the transmitted light are simultaneously acquired by a first focus camera 16, which is in focus; a second focus camera 17, which is at positive defocus; and a third focus camera 18, which is at negative defocus. Thus, for every field of view, three images are acquired at three different focal planes. The images captured by the second focus camera 17 (at positive defocus) and the third focus camera 18 (at negative defocus) are compared to each other to detect defects.

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In the Rule 111 Amendment filed on September 14, 2004, Applicants noted that Kena *et al.* only disclose the detection of defects by either comparing die-to-die images from the same focal plane, or comparing a dark field reflection image of a reticle to a transmission image of the same reticle. *See* col. 10, lines 17-21 of Keenan *et al.* Furthermore, Kenan *et al.* fail to teach or suggest comparing a first aerial image of a phase shift mask (in a first out of focus condition) and a second aerial image of the phase shift mask (in a second out of focus condition), both of which are transmission images.

Kenan *et al.* disclose, *inter alia*, two illumination modes: a dark field illumination mode employing a dark field illumination system (4), and a transmission light illumination mode employing a transmission light illumination system (5). A splitter (15) splits the beam to produce three images of the reticle in three cameras. In a transmission light illumination mode, for every field of view, three different focus images of the reticle (1) in the transmitted light are simultaneously acquired by a first camera (16), which is in focus; and two other cameras (17 and 18), which are at two edges of a simulated process window of the exposure system. *See* col. 8, lines 1-10 of Kenan *et al.* In the dark field illumination mode, for every field of view, three images of the reticle are acquired: two transmission aerial images at different focal planes produced by cameras 17 and 18; and a high resolution dark field reflection image produced by the camera 16. *See* col. 9, lines 23-26 of Kenan *et al.*

In addition, Kenan *et al.* disclose two image processing modes. In a die-to-die processing mode, images from one die are compared to images of another die. To the extent that Kenan *et al.* may disclose the use of positive and negative focus images (*i.e.*, claim 9 of Kenan *et al.*),

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those images are compared between different dies. *See, e.g.*, col. 10, lines 42-53. Clearly, Kenan *et al.* lack any teaching or suggestion that the positive and negative focus images of the same die are compared to each other. In a transmitted-reflected mode, a dark field reflection image of the reticle and a transmission image of the same reticle, instead of two transmission images, are compared to each other. *See* col. 10, lines 17-21 of Kenan *et al.* Again, while Kenan *et al.* may disclose image comparison, Kenan *et al.* lack any teaching or suggestion of comparing two images of the same die, each having different focus conditions, to detect phase defects and errors. In sum, Kenan *et al.* and the inventions recited in claims 1, 11 and 23 compare different images in different ways to detect different defects.

Thus, Applicants submit that Kenan *et al.* fail to teach or suggest the inventions recited in independent claims 1, 11 and 23, and further submit that the inventions recited in independent claims 1, 11 and 23 are not obvious from Kenan *et al.* Therefore, Applicants respectfully submit that independent claims 1, 11 and 23 are patentable over Kenan *et al.*, and further submit that claims 2-10, 12-22 and 24-34 are allowable as well, at least by virtue of their dependency from claims 1, 11 and 23, respectively. Therefore, Applicants respectfully request that the rejection of claims 1-34 under the judicially created doctrine of obviousness-type double patenting be reconsidered and withdrawn.

2. Claims 1-34 stand rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Kenan *et al.* Applicants traverse the rejection of claims 1-34 for at least the reasons discussed below.

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To support a conclusion that a claimed invention lacks novelty under 35 U.S.C. § 102, a single source must teach all of the elements of a claim. *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379 (Fed. Cir. 1986). A claim is anticipated only if each and every element as set forth in the claim is found either expressly or inherently in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). Rejections under 35 U.S.C. § 102 are proper only when the claimed subject matter is identically disclosed or described in the prior art.

As discussed above with respect to the obviousness-type double patenting, *Kenan et al.* fail to teach or suggest the comparison of transmission images of a phase shift mask at different focus conditions to each other to detect phase defects and errors in the mask. Instead, *Kenan et al.* disclose either comparing die-to-die images from the same focal plane to detect errors in line width, or comparing a reflection image and a transmission image to detect surface defects. Nowhere in *Kenan et al.* is there any teaching or suggestion of comparing two out of focus transmission images of a phase shift mask with each other to detect errors.

Thus, Applicants submit that *Kenan et al.* fail to teach or suggest the inventions recited in independent claims 1, 11 and 23. Therefore, Applicants respectfully submit that independent claims 1, 11 and 23 are allowable over *Kenan et al.*, and further submit that claims 2-10, 12-22 and 24-34 are allowable as well, at least by virtue of their dependency from claims 1, 11 and 23, respectively. Therefore, Applicants respectfully request that the rejection of claims 1-34 under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

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3. Claims 1, 2, 5, 6, 9, 11-16, 19, 21 and 22 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,327,033 to Ferguson *et al.* Applicants traverse the rejection of claims 1, 2, 5, 6, 9, 11-16, 19, 21 and 22 for at least the reasons discussed below.

In the Rule 111 Amendment filed on September 14, 2004, Applicants noted that Ferguson *et al.* does not teach or suggest the first and the second aerial image of the phase shift mask produced from the same light transmitted by the mask. The Patent Office responded that, in Ferguson *et al.*, the same light source is transmitted by the mask. Applicants respectfully disagree with the Patent Office's interpretation of the term "the same light transmitted by the mask."

A skilled artisan would appreciate that "the same light transmitted by the mask" means the same light from the mask in response to illumination, instead of "the same light source transmitted by the mask." The specification of the present application supports such an interpretation. In line 16 of page 10, the specification states that the objective (10) (shown in Fig. 1) collects the light transmitted by the reticle (1) in the transmission light illumination operating mode. A skilled artisan would appreciate that what is collected by the objective (10) is the light from the reticle 1 in response to illumination, not the light source (3). Accordingly, images collected in different passes, as illustrated in Figure 10 of Ferguson *et al.*, are not the same light transmitted by the mask, no matter whether the light source is the same.

In Figure 11 of Ferguson *et al.*, the images are obtained in a one pass inspection by inspection optics (731 and 732) arranged serially in the moving direction of the mask. The light

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collected by the two optics is from two different parts of the mask (700), and is not the same light transmitted by the mask. Furthermore, Ferguson *et al.* fail to teach or suggest that the two out of focus images are created simultaneously by the light transmitted by the mask. Figure 11 of Ferguson *et al.* clearly illustrates that two different light sources are required, hence, two different light beams are creating the images. Moreover, the images are not being simultaneously produced from the same light transmitted by the mask. In Ferguson *et al.*, different light beams, traversing different parts of the mask at the same time, are used to create the mask images. *See, e.g.*, col. 8, lines 5-18 of Ferguson *et al.* Thus, Ferguson *et al.* do not teach or suggest the comparison of two out of focus transmission images, produced concurrently by the same light transmitted through a phase shift mask, with each other to detect errors in the phase shift mask.

Thus, Applicants submit that Kenan *et al.* fail to teach or suggest the inventions recited in independent claims 1 and 11. Therefore, Applicants respectfully submit that independent claims 1 and 11 are allowable, and further submit that claims 2, 5, 6, 9, 12-16, 21 and 22 are allowable as well, at least by virtue of their dependency from claims 1 and 11, respectively. Therefore, Applicants respectfully request that the rejection of claims 1, 2, 5, 6, 9, 11-16, 19, 21 and 22 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

4. Claims 3, 4, 7, 8, 10, 17, 18, 20 and 23-33 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Ferguson *et al.* in view of U.S. Patent No. 5,576,829 to

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Shiraishi et al. Applicants traverse the rejection of claims 3, 4, 7, 8, 10, 17, 18, 20 and 23-33 for at least the reasons discussed below.

Claims 3, 4, 7, 8 and 10 depend upon claim 1. Applicants submit that *Shiraishi et al.* do not cure the deficiencies of *Ferguson et al.* with respect to the comparison of two out of focus transmission images, produced concurrently by the same light transmitted through a phase shift mask, with each other to detect errors in the phase shift mask, as recited in claim 1. Since neither reference teaches or suggests the comparison of two images concurrently produced by the same light transmitted by a phase shift mask, Applicants submit that one of ordinary skill would not be motivated to combine *Ferguson et al.* with *Shiraishi et al.* Applicants submit that claims 3, 4, 7, 8 and 10 are allowable at least by virtue of their dependency from claim 1. Therefore, Applicants respectfully request that the rejection of claims 3, 4, 7, 8 and 10 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 17, 18 and 20 depend upon claim 11. Applicants submit that *Shiraishi et al.* do not cure the deficiencies of *Ferguson et al.* with respect to the comparison of two out of focus transmission images, produced concurrently by the same light transmitted through a phase shift mask, with each other to detect errors in the phase shift mask, as recited in claim 11. Since neither reference teaches or suggests the comparison of two images concurrently produced by the same light transmitted by a phase shift mask, Applicants submit that one of ordinary skill would not be motivated to combine *Ferguson et al.* with *Shiraishi et al.* Applicants submit that claims 17, 18 and 20 are allowable at least by virtue of their dependency from claim 11. Therefore,

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Applicants respectfully request that the rejection of claims 17, 18 and 20 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Applicants submit that Shiraishi *et al.* do not cure the deficiencies of Ferguson *et al.* with respect to the comparison of two out of focus transmission images, produced concurrently by the same light transmitted through a phase shift mask, with each other to detect errors in the phase shift mask, as recited in claim 23. Since neither reference teaches or suggests the comparison of two images concurrently produced by the same light transmitted by a phase shift mask, Applicants submit that one of ordinary skill would not be motivated to combine Ferguson *et al.* with Shiraishi *et al.* Applicants submit that claim 23 is allowable over the combination of Ferguson *et al.* and Shiraishi *et al.*, and further submit that claims 24-33 are allowable as well, at least by virtue of their dependency from claim 23. Therefore, Applicants respectfully request that the rejection of claims 23-33 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

5. Claim 34 stands rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Ferguson *et al.* in view of Shiraishi *et al.* and further in view of U.S. Patent No. 6,078,393 to Oohashi *et al.* Applicants traverse the rejection of claims 3, 4, 7, 8, 10, 17, 18, 20 and 23-33 for at least the reasons discussed below.

Applicants submit that Oohashi *et al.* do not cure the deficiencies of the combination of Ferguson *et al.* and Shiraishi *et al.* with respect to the comparison of two out of focus transmission images, produced concurrently by the same light transmitted through a phase shift mask, with each other to detect errors in the phase shift mask, as recited in claim 23 and included

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in claim 34 via dependency. Since neither reference teaches or suggests the comparison of two images concurrently produced by the same light transmitted by a phase shift mask, Applicants submit that one of ordinary skill would not be motivated to combine Ferguson *et al.* with Shiraishi *et al.* and Oohashi *et al.* Applicants submit that claim 34 is allowable over the combination of Ferguson *et al.*, Shiraishi *et al.* and Oohashi *et al.*, and respectfully request that the rejection of claim 34 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

SUGHRUE MION, PLLC
Telephone: (650) 625-8100
Facsimile: (650) 625-8110

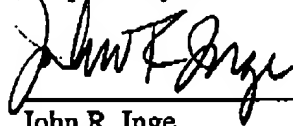
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23493

CUSTOMER NUMBER

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Respectfully submitted,



John R. Inge
Registration No. 26,916

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this AMENDMENT UNDER 37 C.F.R. § 1.116 is being facsimile transmitted to the U.S. Patent and Trademark Office this 7th day of April, 2005.


Monica Moreno